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Conservation and Utilization of Plant Genetic Resources in Myanmar

By

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Introduction

Plant genetic resources (PGR) are the most valuable and essential basic raw materials to meet the current and future need of crop improvement programmes. A wider genetic base assume priority in plant breeding research aimed at developing new varieties for increased crop production. PGR for food and agriculture are a reservoir of genetic adaptability, which acts as a buffer against environmental changes and economic challenges. The erosion of these resources results in a severe threat to the world's long term food security. The fundamental objective of genetic resources conservation is the maintenance of genetic diversity within each of the species. In general PGR include all species which contribute to people by providing food, medicine, feed for domestic animals, fiber, clothing, shelter, and other use. PGRs are our heritage which needs conservation for posterity.

For a primarily agriculture-based country like Myanmar, the conservation and utilization of PGR is important for economic development and food security. Our country has tremendous potential on agriculture because of its great ethnic and geographic diversity. Myanmar is home to many tropical crops species, genetic diversity is very abundant. The agriculture sector plays a major role in the economy of Myanmar. PRG is one of the major components for the enhancement of agricultural programme. The appropriate conservation and utilization of PGR is one of the key elements which can greatly contribute to the success of agriculture development and food security in Myanmar.

PGR Management in Myanmar Background

Myanmar had recognized the value of PGR even before modern agricultural technology

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was introduced. Orchards, vegetables, and medicinal plants gardens dot the countryside. The central Agriculture Research Institute, the former CARI, now, the Department of Agricultural Research (DAR) in Yezin which is the agency primarily tasking to look after Myanmar's PGR, colleting and conserving PGR have started long before established Seed banks, with more than 3000 accession of local rice varieties collected and maintained. In situ conservation of mango and medicinal plants was initiated in 1980. Systematic PGR management began after the establishment of the Seed Bank at CARI / DAR in 1987 with the support of the Japan International Cooperation Agency (JICA). Technical cooperation between Myanmar and Japan for PGR management was launched in 1997. Similarly the horticultural crops have collected and maintained in Vegetables and Fruits Research and Development Centre (VFRDC) since 1987. The VFRDC was established in 1986 and donated by JICA. The vegetables and Fruits germplasm collection began in 1998 and was supported by F.A.O.

PGR management system of Myanmar adopted the following steps:

(1) Exploration,
(2) Classification
(3) Collection
(4) Multiplication
(5) Rejuvenation
(6) Characterization
(7) Evaluation
(8) Conservation
(9) Data management
(10) Utilization

Objectives

The VFRDC has the following objectives dealing with PGR in Mayanmar. They are:

(1) To establish the PGR management system in Myanmar.

(2) To conserve and characterize vegetable and fruits collected from different regions of Myanmar.

(3) To select the promising varieties for farmer

(4) To upgrade the knowledge and technologies on PGR management of local scientists, and

(5) To exchange PGR and related information in national and global scale.

PGR Conservation Priorities

The Seed Bank is placed under DAR conserves crop species in line with national economic policies. Therefore, collection and conservation of rice, oil seed crops, and food legumes are given priority.

The VFRDC conserves horticulture species in line with national economic policies. Conservation of medicinal orchids, kitchen crops, such as ginger, chili, onion, potato, and bio-diesel crops (Jatropha).

Exploration, Collection and Introduction Activities

At present, totally, 13,046 accessions for 28 crop species are collected by *ex situ* collection in Seed Bank conservation under the DAR.

From 1998 to 2006, in the implementation of germplasm collection, 1,155 accessions of vegetables and 340 accessions of fruits have been collected and conserved in VFRDC.

Multiplication, Characterization and Evaluation Activities

Characterization of germplasm based on morphological characters and molecular markers. Morphological characters are used for basic characterization according to the descriptors. This technique is capable to reach a high sample through put and this information is of high interest for users of genetic diversity of PGR. Molecular markers provide an extremely useful technology for conservation and use of PGR. VFRDC is working on the biodiversity project collaboration with Tsukuba University, Japan. All results suggest that Myanmar germplasm belong to a rich genetic variation at molecular level. Up to now, 896 accessions of vegetables and 241 accessions of fruits (especially in fruit quality) have been characterized and evaluated in VFRDC. These research activities have been conducted in VFRDC, Myanmar Agriculture Service (MAS) and its related horticultural farms. There are 61 horticultural farms are administrated under MAS, Ministry of Agriculture and Irrigation (MOAI). Among them, 16 research farms from different ecological regions of Myanmar are collaborated with VFRDC for PGR research. Some of the varieties, such as potato and strawberry cannot multiply in VFRDC because of temperature and climate. Therefore, we conserve them by tissue culture and sent to other suitable regions for multiplication and locality tests. VFRDC also cooperates with Yezin Agricultural University, DAR, and University of Yangon to conduct some of PGR research activities.

Conservation and Utilization

The objective of the conservation is to preserve PGR safely without loss in viability, genetic integrity while maintaining original spectrum of variability. VFRDC has three types of cold storage facilities: 0-5ºC, 5-10ºC, and 10-15ºC room temperature without R.H controller. The cold storage facilities of VFRDC are still required for germplasm conservation. The collected seeds were packed in aluminum foil bags and stored in above storage rooms. Most of fruit crops were conserved in field genebank. The seed bank has three types of conservation facilities: short-term, medium, and long-term storage rooms. Seeds of active collection in polyethylene bottles are stored in short-term facilities maintained at 5-10ºC with 30-40% RH. Seeds of base collection are vaccum packed in aluminum foil bags and stored in medium to long-term facilities maintained at -5ºC with 30-40% RH.

Crop germplasm conserved in the Seed Bank & VFRDC are supplied upon request. Seed distribution for other government agencies within Myanmar has been done after accomplishing the official request form. In the case of international requests, seeds are supplied with Material Transfer Agreement (MTA). Totally, 680 crop germplasm accessions of Seed Bank, Dept. of agricultural Research (DAR) have been distributed within Myanmar and 4,555 accessions have been supplied to the International Rice Research Institute (IRRI), the National Institute of Agro-biological sciences (NIAS-JAPAN), Kyushu University of Japan, and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Totally, 290 accessions of horticultural crop germplasm have been distributed from VFRDC to abroad (Okayama University, NIAS-JAPAN, JICA) with Material Transfer Agreement.

Documentation and data management forms and formats have been unified and database construction has also been completed in DAR, Yezin. Within DAR, a Local Area Network (LAN) system has been established for smooth data flow. Documentation and data management of PGR in VFRDC has still required and upgraded.

Pre-breeding activities should be carried out to assure better use PGR and to link crop breeding programme. Pre-breeding activities are expected to include critical evaluation of crop germplasm for specific traits such as bacterial blight resistance, bacterial wilt resistance, fruit and shoot borer (FSB) resistance, grain quality, fruits quality, and so on. The promising varieties of some vegetables (F_1 Melon Tomato, Chili, Egg plant, Okra, YLB, Cucumber, Pumpkin, and etc.) were selected and hybridized by using PGR in long term breeding programme of VFRDC.

Conclusion

Although PGR is very abundant, the adoption rate of modern varieties and technology continue to increase to feed 54 million people in Myanmar. So, many traditional varieties and landraces would give way to modern varieties. In addition, the destruction of habitats of wild species and related genera because of rapid urbanization is predictable in near future as the population increase. In order to prevent the permanent loss of genetic diversity in many tropical crop species, PGR management, conservation and utilization research activities have become critical issues for Myanmar agriculture improvement. There have several thousand materials of germplasm collected from domestic and introduced origins have been conserved in seedbank and other facilities but breeding materials are still of scarceness. A strong national programme on plant genetic resources conservation and utilization also needs to be developed by commitment and supported from various national and international state holders. In order to promote PGR management and research activities, the numbers of members with suitable qualification need to be increased. Therefore, training in PGR management at the national and international levels is apparently essential. Myanmar recognizes the value of PGR for both present and the future. Within our capacity, Myanmar is working to value and conserve PGR as a national heritage. Therefore, Myanmar needs all possible assistance, financial or in kind, technical backstopping, collaborative research, information and public awareness materials, and working relationship with international scientists in PGR management. Through the exchange of PGR and PGR information, Myanmar would be able to strengthen its goodwill with partner countries.

Table 1. Germplasm conservation of vegetables in VFRDC

No.	Crop	No. of accession	Conservation
1	Solanaceae	341	Field & storage
2	Cucurbitaceae	261	Field & storage
3	Cruciferae	210	Field & storage
4	Fabaceae	95	Field & storage
5	Zingiberaceae	64	Field & storage
6	Others (eg. Onion, Okra, etc.)	184	Field & storage
	Total	**1155**	

Table 2. Germplasm conservation of fruits in VFRDC

No.	Crop	No. of accession	Conservation
1	Mangoes	182	Field
2	Dragon Fruit	3	Field
3	Grape	8	Field
4	Durian	2	Field
5	Mangosteen	3	Field
6	Pummelo	6	Field
7	Banana	35	*In vitro* and field
8	Orange	11	*In vitro* and field
9	Pineapple	6	*In vitro* and field
10	Strawberry	3	*In vitro* and field
11	Potato	32	*In vitro* and field
12	Custard Apple	1	Field
13	Sour soap	1	Field
14	Marian	2	Field
15	Lychee	1	Field
16	Star Fruit	1	Field
17	Java Apple	3	Field
18	Sapodilla	1	Field
19	Guava	2	Field
20	Indian jujube	1	Field
21	Hog Plum	1	Field
22	Kepundung	1	Field
23	Bael Fruit	1	Field
24	Jack Fruit	3	Field
25	Rambutan	1	Field
26	Djenkol Bean	1	Field
27	Dwarf Coconut	1	Field
28	Pome granate	3	Field
29	Star Apple	1	Field
30	Kadibathi	1	Field
31	Papaya	3	Field
32	Others (Orchids, Jatropha, Aloe, etc.)	19	*In vitro* and field
	Total	**340**	

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